

**WHAT IS CLAIMED IS:**

- 1 1. A method for facilitating inverse multiplexing over asynchronous transfer mode,  
2 comprising:  
3 receiving a stream of sequentially aligned ATM cells via an originating end point  
4 logical communication link;  
5 associating a sequence identifier with each one of said ATM cells for creating  
6 sequence identified ATM cells; and  
7 forwarding said sequence identified ATM cells in a distributed manner over a  
8 plurality of IM communication links, wherein a first one of said IM communication  
9 links having disparate data transmission rates in at least one data transmission  
10 direction with respect to a second one of said IM communication links.
- 1 2. The method of claim 1 wherein associating the sequence identifier includes  
2 determining a sequence code for each one of said ATM cells and inserting the  
3 sequence code for each one of said ATM cells into an information payload portion of a  
4 corresponding one of said ATM cells.
- 1 3. The method of claim 1 wherein associating the sequence identifier includes  
2 determining a sequence code for each one of said ATM cells and inserting the  
3 sequence code for each one of said ATM cells into a header portion of a corresponding  
4 one of said ATM cells.
- 1 4. The method of claim 1 wherein associating the sequence identifier is facilitated by an  
2 originating endpoint IMA-ADSL communication device.
- 1 5. The method of claim 1 wherein forwarding said sequence identified ATM cells in a  
2 distributed manner over a plurality IM communication links includes forwarding said  
3 sequence identified cells over a plurality of IM-ADSL communication links.
- 1 6. The method of claim 5 wherein:

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2 a first one of said IM-ADSL communication links is synchronized at a first  
3 upstream data transmission rate; and  
4 a second one of said IM-ADSL communication links is synchronized at a second  
5 upstream data transmission rate different than the first upstream data transmission rate.

1 7. The method of claim 5 wherein:

2 a first one of said IM-ADSL communication links is synchronized at a first  
3 downstream data transmission rate; and  
4 a second one of said IM-ADSL communication links is synchronized at a second  
5 downstream data transmission rate different than the first downstream data  
6 transmission rate.

1 8. The method of claim 5 wherein:

2 a first one of said IM-ADSL communication links is synchronized at a first  
3 downstream data transmission rate and at a first upstream data transmission rate; and  
4 a second one of said IM-ADSL communication links is synchronized at a second  
5 downstream data transmission rate different than the first downstream data  
6 transmission rate and at a second upstream data transmission rate different than the  
7 first upstream data transmission rate.

1 9. The method of claim 1, further comprising:

2 receiving said sequence identified ATM cells by a destination endpoint IMA  
3 communication device; and  
4 forwarding an aligned stream of inversely multiplexed ATM cells across a  
5 destination endpoint logical communication link.

1 10. The method of claim 9 wherein receiving said sequence identified ATM cells includes  
2 holding at least a portion of said sequence identified ATM cells in a data storage  
3 device.

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- 1 11. The method of claim 10 wherein forwarding the aligned stream of inversely  
2 multiplexed ATM cells includes sequentially retrieving said sequence identified ATM  
3 cells from the data storage device.
- 1 12. The method of claim 11 wherein sequentially retrieving said sequence identified ATM  
2 cells includes determining the sequence identifier associated with a plurality of said  
3 sequence identified ATM cells.
- 1 13. The method of claim 1, further comprising:  
2 receiving said sequence identified ATM cells at a destination endpoint IMA  
3 communication device;  
4 determining a next one of said sequence identified ATM cells to forward over a  
5 destination endpoint logical communication link; and  
6 forwarding the next one of said sequence identified ATM cells over the destination  
7 endpoint logical communication link.
- 1 14. The method of claim 13 wherein determining the next one of said sequence identified  
2 ATM cells includes determining the sequence identifier for a plurality of sequence  
3 identified ATM cells.
- 1 15. The method of claim 13 wherein determining and forwarding are facilitated by the  
2 destination endpoint IMA communication device.

1 16. A method for facilitating inverse multiplexing over asynchronous transfer mode,  
 2 comprising:  
 3 receiving a stream of sequentially aligned ATM cells via an originating end point  
 4 logical communication link;  
 5 determining a sequence code for each one of said ATM cells;  
 6 inserting the sequence code for each one of said ATM cells into an information  
 7 block a corresponding one of said ATM cells for creating sequence identified ATM  
 8 cells;  
 9 forwarding said sequence identified ATM cells in a distributed manner over a  
 10 plurality of IM communication links, wherein a first one of said IM communication  
 11 links having disparate data transmission rates in at least one data transmission  
 12 direction with respect to a second one of said IM communication links;  
 13 receiving said sequence identified ATM cells at a destination endpoint IMA  
 14 communication device;  
 15 determining a next one of said sequence identified ATM cells to forward over a  
 16 destination endpoint logical communication link; and  
 17 forwarding the next one of said sequence identified ATM cells over the destination  
 18 endpoint logical communication link.

1 17. The method of claim 16 wherein forwarding said sequence identified ATM cells in a  
 2 distributed manner over a plurality IM communication links includes forwarding said  
 3 sequence identified cells over a plurality of IM-ADSL communication links, each one  
 4 of the plurality of IM-ADSL communication links synchronized at disparate data  
 5 transfer rates relative to each other one of the plurality of IM-ADSL communication  
 6 links.

1 18. An apparatus for facilitating inverse multiplexing over asynchronous transfer mode  
 2 (IMA), the apparatus including an originating endpoint IMA communication device, a  
 3 destination endpoint IMA communication device, and a plurality of IM  
 4 communication links implemented therebetween, a first one of said IM communication  
 5 links synchronized at a disparate data transmission rate in at least one data  
 6 transmission direction with respect to a second one of said IM communication links,  
 7 the originating endpoint IMA communication device being capable of:  
 8 receiving a stream of sequentially aligned ATM cells via an  
 9 originating end point logical communication link;  
 10 associating a sequence identifier with each one of said ATM cells  
 11 for creating sequence identified ATM cells; and  
 12 forwarding said sequence identified ATM cells in a distributed  
 13 manner over the plurality of IM communication links, wherein a first one of  
 14 said IM communication links having disparate data transmission rates in at  
 15 least one data transmission direction with respect to a second one of said  
 16 IM communication links.

1 19. The apparatus of claim 18 wherein the originating endpoint IMA communication  
 2 device being capable of associating the sequence identifier includes the originating  
 3 endpoint IMA communication device being capable of determining a sequence code  
 4 for each one of said ATM cells and inserting the sequence code for each one of said  
 5 ATM cells into a information payload portion of a corresponding one of said ATM  
 6 cells.

1 20. The apparatus of claim 18 wherein the originating endpoint IMA communication  
 2 device being capable of associating the sequence identifier includes the originating  
 3 endpoint IMA communication device being capable of determining a sequence code  
 4 for each one of said ATM cells and inserting the sequence code for each one of said  
 5 ATM cells into a header portion of a corresponding one of said ATM cells.

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- 1 21. The apparatus of claim 18 wherein the originating endpoint IMA communication  
2 device is an originating endpoint IMA-ADSL communication device, the destination  
3 endpoint IMA communication device is a destination end-point IMA-ADSL  
4 communication device and the plurality of IM communication links are a plurality of  
5 IM-ADSL communication links.
- 1 22. The apparatus of claim 21 wherein:  
2 a first one of said IM-ADSL communication links is synchronized at a first  
3 upstream data transmission rate; and  
4 a second one of said IM-ADSL communication links is synchronized at a second  
5 upstream data transmission rate different than the first upstream data transmission rate.
- 1 23. The apparatus of claim 21 wherein:  
2 a first one of said IM-ADSL communication links is synchronized at a first  
3 downstream data transmission rate; and  
4 a second one of said IM-ADSL communication links is synchronized at a second  
5 downstream data transmission rate different than the first downstream data  
6 transmission rate.
- 1 24. The apparatus of claim 21 wherein:  
2 a first one of said IM-ADSL communication links is synchronized at a first  
3 downstream data transmission rate and at a first upstream data transmission rate; and  
4 a second one of said IM-ADSL communication links is synchronized at a second  
5 downstream data transmission rate different than the first downstream data  
6 transmission rate and at a second upstream data transmission rate different than the  
7 first upstream data transmission rate.
- 1 25. The apparatus of claim 18 wherein the destination endpoint IMA communication  
2 device being capable of:  
3 receiving said sequence identified ATM cells; and

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4 forwarding an aligned stream of inversely multiplexed ATM cells  
5 across a destination endpoint logical communication link.

1 26. The apparatus of claim 25 wherein the destination endpoint IMA communication  
2 device being capable of receiving said sequence identified ATM cells includes the  
3 destination endpoint IMA communication device being capable of holding at least a  
4 portion of said sequence identified ATM cells in a data storage device.

1 27. The apparatus of claim 26 wherein the destination endpoint IMA communication  
2 device being capable of forwarding the aligned stream of inversely multiplexed ATM  
3 cells includes the destination endpoint IMA communication device being capable of  
4 sequentially retrieving said sequence identified ATM cells from the data storage  
5 device.

1 28. The apparatus of claim 27 wherein the destination endpoint IMA communication  
2 device being capable of sequentially retrieving said sequence identified ATM cells  
3 includes the destination endpoint IMA communication device being capable of  
4 determining the sequence identifier associated with a plurality of said sequence  
5 identified ATM cells.

1 29. The apparatus of claim 18 wherein the destination endpoint IMA communication  
2 device is capable of:  
3 receiving said sequence identified ATM cells via at least two of the plurality of IM  
4 communication links;  
5 determining a next one of said sequence identified ATM cells to forward over a  
6 destination endpoint logical communication link; and  
7 forwarding the next one of said sequence identified ATM cells over the destination  
8 endpoint logical communication link.





31. An apparatus for facilitating inverse multiplexing over asynchronous transfer mode, the apparatus including an originating endpoint IMA-ADSL communication device, a destination endpoint IMA-ADSL communication device, and a plurality of IM communication links implemented therebetween, a first one of said IM-ADSL communication links synchronized at a disparate data transmission rate in at least one data transmission direction with respect to a second one of said IM communication links, the originating endpoint IMA-ADSL communication device being capable of:

- receiving a stream of sequentially aligned ATM cells via an originating end point logical communication link;
- determining a sequence code for each one of said ATM cells;
- inserting the sequence code for each one of said ATM cells into an information block a corresponding one of said ATM cells for creating sequence identified ATM cells;
- forwarding said sequence identified ATM cells in a distributed manner over a plurality of IM communication links, wherein a first one of said IM communication links having disparate data transmission rates in at least one data transmission direction with respect to a second one of said IM communication links; and

the originating endpoint IMA-ADSL communication device being capable of:

- receiving said sequence identified ATM cells at a destination endpoint IMA communication device;
- determining a next one of said sequence identified ATM cells to forward over a destination endpoint logical communication link; and
- forwarding the next one of said sequence identified ATM cells over the destination endpoint logical communication link.

32. A data processor program product, comprising:

- a data processor program processable by a data processor of an originating endpoint IMA communication device; and
- an apparatus from which the data processor program is accessible by the data processor of the originating endpoint IMA communication device;
- the data processor program being capable of enabling the originating endpoint IMA communication device to:

- receive a stream of sequentially aligned ATM cells via an originating end point logical communication link;
- associate a sequence identifier with each one of said ATM cells for creating sequence identified ATM cells; and
- forward said sequence identified ATM cells in a distributed manner over a plurality of IM communication links to a destination endpoint IMA communication device, wherein a first one of said IM communication links having disparate data transmission rates in at least one data transmission direction with respect to a second one of said IM communication links.

33. The data processor program of claim 32 wherein the data processor program being capable of enabling the originating endpoint IMA communication device to associate the sequence identifier includes the data processor program being capable of enabling the originating endpoint IMA communication device to determine a sequence code for each one of said ATM cells and to insert the sequence code for each one of said ATM cells into an information payload portion of a corresponding one of said ATM cells.

34. The data processor program of claim 32 wherein the data processor program being capable of enabling the originating endpoint IMA communication device to associate the sequence identifier includes the data processor program being capable of enabling the originating endpoint IMA communication device to determine a sequence code for each one of said ATM cells and to insert the sequence code for each one of said ATM cells into a header portion of a corresponding one of said ATM cells.

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1 35. The data processor program of claim 32 wherein the data processor program being  
2 capable of enabling the originating endpoint IMA communication device to forward  
3 said sequence identified ATM cells in a distributed manner over a plurality IM  
4 communication links includes the data processor program being capable of enabling  
5 the originating endpoint IMA communication device to forward said sequence  
6 identified cells over a plurality of IM-ADSL communication links.

1 36. The data processor program of claim 35 wherein:  
2 a first one of said IM-ADSL communication links is synchronized at a first  
3 upstream data transmission rate; and  
4 a second one of said IM-ADSL communication links is synchronized at a second  
5 upstream data transmission rate different than the first upstream data transmission rate.

1 37. The data processor program of claim 35 wherein:  
2 a first one of said IM-ADSL communication links is synchronized at a first  
3 downstream data transmission rate; and  
4 a second one of said IM-ADSL communication links is synchronized at a second  
5 downstream data transmission rate different than the first downstream data  
6 transmission rate.

1 38. The data processor program of claim 35 wherein:  
2 a first one of said IM-ADSL communication links is synchronized at a first  
3 downstream data transmission rate and at a first upstream data transmission rate; and  
4 a second one of said IM-ADSL communication links is synchronized at a second  
5 downstream data transmission rate different than the first downstream data  
6 transmission rate and at a second upstream data transmission rate different than the  
7 first upstream data transmission rate.

39. A data processor program product, comprising:

- a data processor program processable by a data processor of a destination endpoint IMA communication device; and
- an apparatus from which the data processor program is accessible by the data processor of the destination endpoint IMA communication device;
- the data processor program being capable of enabling the destination endpoint IMA communication device to:
  - receive sequence identified ATM cells in a distributed manner via a plurality of IM communication links from an originating endpoint IMA communication device ; and
  - forward an aligned stream of inversely multiplexed ATM cells across a destination endpoint logical communication link.

40. The data processor program of claim 39 wherein the data processor program being capable of enabling the destination endpoint IMA communication device to receive said sequence identified ATM cells includes the data processor program being capable of enabling the destination endpoint IMA communication device to hold at least a portion of said sequence identified ATM cells in a data storage device.

41. The data processor program of claim 40 wherein the data processor program being capable of enabling the destination endpoint IMA communication device to forward the aligned stream of inversely multiplexed ATM cells includes the data processor program being capable of enabling the destination endpoint IMA communication device to sequentially retrieve said sequence identified ATM cells from the data storage device.

42. The data processor program of claim 41 wherein the data processor program being capable of enabling the destination endpoint IMA communication device to sequentially retrieve said sequence identified ATM cells includes the data processor program being capable of enabling the destination endpoint IMA communication

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device to determine the sequence identifier associated with a plurality of said sequence identified ATM cells.

43. The data processor program of claim 39 wherein the data processor program being capable of enabling the destination endpoint IMA communication device to forward an aligned stream of inversely multiplexed ATM cells includes the data processor program being capable of enabling the destination endpoint IMA communication device to:

determine a next one of said sequence identified ATM cells to forward over the destination endpoint logical communication link; and forward the next one of said sequence identified ATM cells over the destination endpoint logical communication link.

44. The data processor program of claim 13 wherein the data processor program being capable of enabling the destination endpoint IMA communication device to determine the next one of said sequence identified ATM cells includes the data processor program being capable of enabling the destination endpoint IMA communication device to determine the sequence identifier for a plurality of sequence identified ATM cells.